

Name Key

Date \_\_\_\_\_

## Chapter 11 Geometric Sequence word problems

1. A manufacturer of artificial greenery is considering a new model tree with 4 limbs. Each limb holds four branches, each branch holds four twigs, and each twig holds four leaves. How many leaves will the new model tree require?

$$a_1 = 4$$

$$r = 4$$

$$a_4 = 4(4)^3$$

$$256 \text{ leaves}$$

2. At a telephone switching station the first level of a circuit has 3 lines. At a second level, each of the lines branches into 5 lines, at the third level, each of the lines branches into 5 lines, and so on. How many lines emerge from the fifth level?

$$a_1 = 3$$

$$r = 5$$

$$a_5 = 3 \cdot 5^4$$

$$= 1875 \text{ lines}$$

3. Each year the value of a certain car is 70% of what it was the previous year. If its value was \$5000 at the end of the first year, what was it at the end of the fifth year?

$$a_1 = 5000$$

$$r = .7$$

$$a_5 = 5000(.7)^4$$

$$\$1200.50$$

4. A legendary coin bank has the power of magically doubling the amount of money in it in each day. If \$0.01 is deposited in it on January 1<sup>st</sup>, how much will be in the bank on January 31<sup>st</sup>? (This is not a sum.)

$$a_1 = .01$$

$$r = 2$$

$$a_{31} = .01(2)^{30}$$

$$\$10,737,418.24$$

5. The starting salary at your new job is \$42,000. Each year you receive a 4% raise. How much money will you be making in your 4<sup>th</sup> year? In your 8<sup>th</sup> year?

$$a_1 = 42000$$

$$r = 1.04$$

$$a_4 = 42000(1.04)^3$$

$$\$47244.29$$

$$a_8 = 42000(1.04)^7$$

$$\$55269.13$$

## Geometric and Arithmetic Series Word Problems

6. Kurt can trace his ancestors back through 10 generations. He counts his parents as the first generation back, his four grandparents as the second generation back, and so on. How many ancestors does he have in these 10 generations?

$$a_1 = 2$$

$$a_2 = 4$$

$$r = 2$$

$$S_{10} = \frac{2(1-2^{10})}{1-2} = \boxed{2046}$$

7. You have won a contest sponsored by a local radio station. If you are given the choice of the two payment plans listed below, which plan will pay you more?

- a. Plan A: \$1 on the first day, \$2 on the second day, \$3 on the third day, and so on for two weeks.
- b. Plan B: \$.01 on the first day, \$.02 on the second day, \$.04 on the third day, and so on for two weeks.

A

$$a_1 = 1$$

$$a_2 = 2$$

$$a_3 = 3$$

$$d = 1$$

$$S_{14} = \frac{14}{2} [2(1) + 13(1)] = \boxed{1105}$$

B

$$a_1 = .01$$

$$a_2 = .02$$

$$a_3 = .04$$

$$r = 2$$

$$S_{14} = \frac{.01(1-2^{14})}{1-2} = \boxed{\$163.83}$$

Plan B

8. After the accelerator pedal of a car is released, the driver waits 5s before applying the brakes. During each second after the first, the car rolls 0.9 times the distance it rolled during the preceding second. If the car went 20m during the first second, how far does it go before the brakes are applied?

$$a_1 = 20$$

$$r = .9$$

$$S_5 = \frac{20(1-.9^5)}{1-.9} = \boxed{81.902 \text{ m}}$$

9. A maple tree loses 384 leaves during the first week of fall and  $\frac{3}{2}$  as many each successive week. At the end of 7 weeks all the leaves have fallen. How many leaves fell from the tree?

$$a_1 = 384$$

$$r = \frac{3}{2}$$

$$S_7 = \frac{384(1-\frac{3}{2}^7)}{1-\frac{3}{2}} = \boxed{12,354 \text{ leaves}}$$